International Protocols related to emissions from Thermal Power Plants

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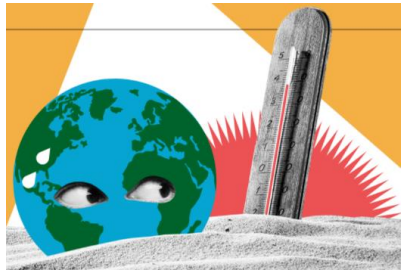
Climate Change

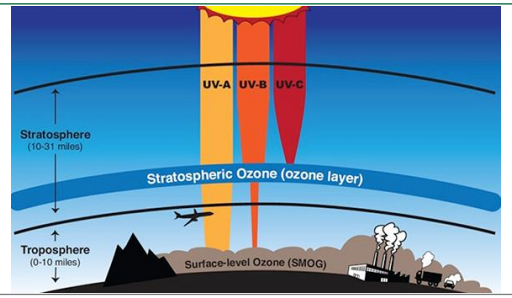


- Climate change has emerged as one of the key issues of the early years of the twenty-first century, bringing together concerns about
  - human relations to nature,
  - the responsibility of rich nations to poorer,
  - the links from local activities to global conditions, and
  - the obligations of present to future generations.
- At the international level the response to climate change has become framed by three key 'narratives' –
  - Asserting that 'dangerous climate change' must be avoided;
  - that the responsibility for climate change is common but differentiated; and
  - that the market – in the form of carbon trading – is the best way to reduce the danger.
- The narratives were powerful to be formalized in international climate conventions that include the 1992 United Nations Framework Convention on Climate Change (UNFCCC) and the 1997 Kyoto Protocol.

Adopted
- 16th September 1987 (International Day for the preservation of the Ozone Layer

Entered into Force
- 1991

Parties
- Universal ratification with 197 parties



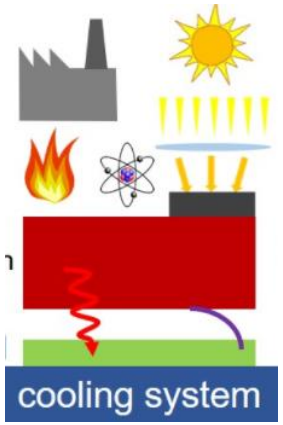
Objectives
- The Montreal Protocol is an international treaty designed to protect the ozone layer by phasing out the production and consumption of numerous substances i.e., CFCs responsible for ozone depletion.
- Although challenges remain, the Montreal Protocol has been recognized as a global success, demonstrated by the massive elimination of production and consumption of chlorofluorocarbons (CFCs), halons, carbon tetrachloride, and methyl chloroform worldwide since it came into force.

Financial Mechanism
- dedicated financial mechanism for the implementation of the Montreal Protocol.
- Established by a decision of the Second Meeting of the Parties to the Montreal Protocol (London, June 1990) and began its operation in 1991.

https://www.un.org/en/climatechange/what-is-climate-change
https://scied.ucar.edu/learning-zone/atmosphere/ozone-layer

Montreal Protocol (Financial Mechanism)

	Multilateral Fund (MLF)	Global Environment Facility (GEF)
Objectives	• To assist developing country parties to the Montreal Protocol whose annual per capita consumption and production of ozone depleting substances (ODS) is less than 0.3 kg to comply with the control measures of the Protocol.	• Assisting 18 countries with economies in transition in Eastern Europe and former Soviet Union in meeting their obligations to phase out the use and production of ozone-depleting substances according to the Montreal Protocol.
Activities	• Industrial conversion, • Technical assistance, • Training and capacity building worth over US $2.8 billion.	
Mode of Activities	• The MLF is replenished based on the principle of stable and sufficient funding to support developing countries to meet Protocol's objectives. • Performance based agreements between the Country and the Executive Committee of the MLF are key to the success of the financial mechanism and to delivering results.	
Implementing Agency	• UNDP established the dedicated Montreal Protocol Unit (MPU) in 1991 to spearhead and coordinate its efforts to support the developing countries.	
Achievements	– Assisted partner developing countries to access a total of ***US $630 million*** in funding from ***the Multilateral Fund (MLF)*** for the Implementation of the Montreal Protocol and ***US$ 33.5 million*** from the ***Global Environment Facility (GEF)**** to eliminate ozone depleting chemicals. – Assisted 118 countries to avoid over 4 gigatons of CO_2-$_{eq}$ emissions on a cumulative basis and to eliminate more than 68,500 tones of ozone-depleting substances.	



Kyoto Protocol

Kyoto Protocol

Adopted	• 11 December 1997
Entered into Force	• 16 February 2005
Parties	• 192 Countries

Goal

- Kyoto Protocol operationalizes the ***United Nations Framework Convention on Climate Change*** by committing industrialized countries and economies in transition to limit and ***reduce greenhouse gases (GHG) emissions*** in accordance with agreed individual targets.
- The Convention itself only asks those countries to ***adopt policies*** and ***measures on mitigation and to report periodically***.
- To stabilize the concentration of greenhouse gases in the atmosphere "at a level that would prevent dangerous anthropogenic (human) interference with the climate system."

Mechanism

- The Kyoto Protocol is based on the principles and provisions of the Convention and follows its annex-based structure.
- It only binds developed countries and places a heavier burden on them under the principle of “common but differentiated responsibility and respective capabilities”, because it recognizes that they are largely responsible for the current high levels of GHG emissions in the atmosphere.

Commitments

- Two Commitment Periods:
  - 1st Commitment Periods (2008 – 2012)
  - 2nd Commitment Periods (2013 – 2020)

Kyoto Protocol

	First Commitment Period (2008 – 2012)	Second Commitment Period (2013 – 2020)
Objectives	• The Kyoto Protocol sets binding emission reduction targets for 37 industrialized countries and economies in transition and the European Union. • Overall, these targets add up to an average 5 per cent emission reduction compared to 1990 levels over the five-year period.	• On 8 December 2012, at the eighth session of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP), held in Doha, Qatar. • In accordance with Articles 20 and 21 of the Protocol, the Parties adopted an Amendment to the Kyoto Protocol by Decision 1/CMP.8.
Targets	• The targets cover emissions of the main greenhouse gases, namely: – Carbon dioxide (CO_2) – Methane (CH_4) – Nitrous oxide (N_2O) – Hydrofluorocarbons (HFCs) – Perfluorocarbons (PFCs) – Sulphur hexafluoride (SF_6) 	• The targets cover emissions of the seven greenhouse gases, namely: – Carbon dioxide (CO_2) – Methane (CH_4) – Nitrous oxide (N_2O) – Hydrofluorocarbons (HFCs) – Perfluorocarbons (PFCs) – Sulphur hexafluoride (SF_6) – Nitrogen trifluoride (NF_3) 
Driving Force	• Occurrence of the global warming	• Human made CO_2 emission.
Parties Assigned Amount of Emission	• The maximum amount of emissions (CO_2e) that a Party may emit over a commitment period in order to comply with its emissions target is known as a Party's assigned amount.	
Financial Mechanism	• Adaptation Fund to finance adaptation projects and programmes.	

Kyoto Protocol

Sectors/ Source Categories

Energy

- Fuel combustion
  - Energy industries
  - Manufacturing industries and construction
  - Transport
  - Other sectors
  - Other
- Fugitive emissions from fuels
  - Solid fuels
  - Oil and natural gas
  - Other

Industrial processes

- Mineral products
- Chemical industry
- Metal production
- Other production

- Production of halocarbons and sulphur hexafluoride
- Consumption of halocarbons and sulphur hexafluoride
- Other

Agriculture

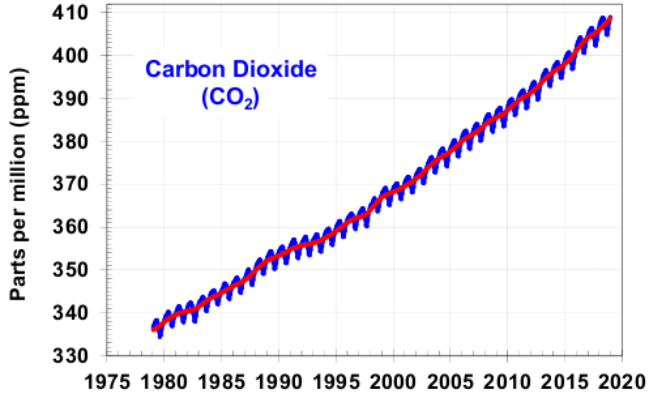
- Enteric fermentation
- Manure management
- Rice cultivation
- Agricultural soils
- Prescribed burning of savannas
- Field burning of agricultural residues
- Other

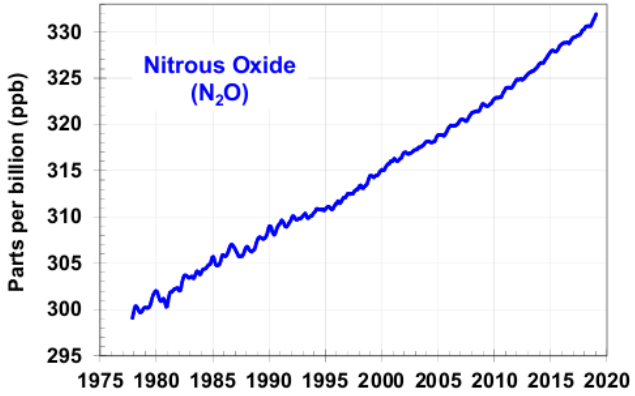
Waste

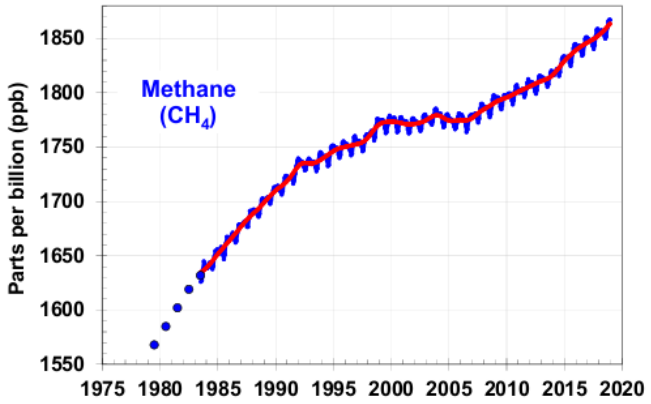
- Solid waste disposal on land
- Wastewater handling
- Waste incineration
- Other

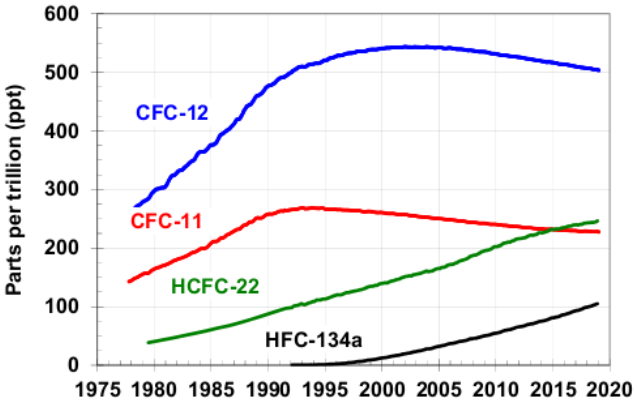
Kyoto Protocol

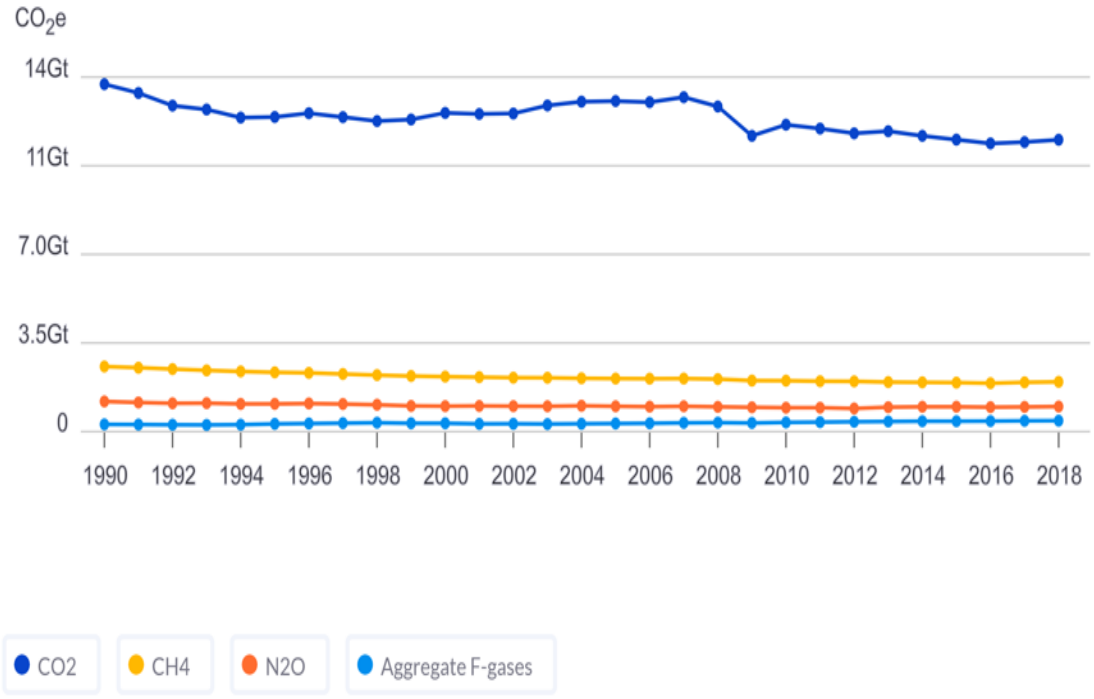
Emissions







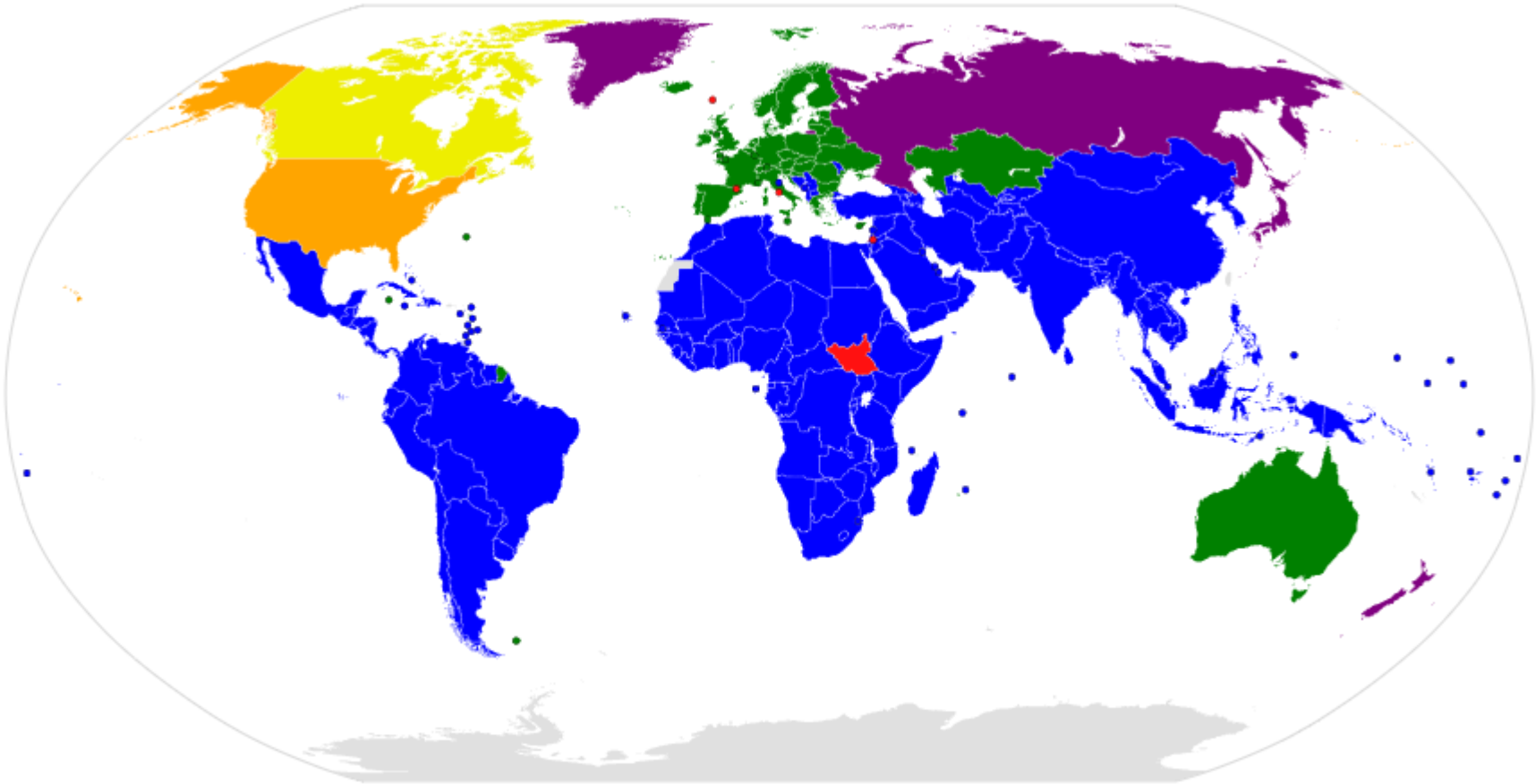




Kyoto Protocol

Parties Overview

- Based on ratifying, parties were splitted into two main groups:
  - Annex Parties with binding targets in the second period.
  - Annex Parties with binding targets in the first period but not the second.
  - Non-Annex parties without binding targets
  - Annex Parties with binding targets in the first period but which withdrew from the protocol.
  - Signatories to the protocol that have not ratified.
  - Other UN member states and observers that are not party to the Protocol.



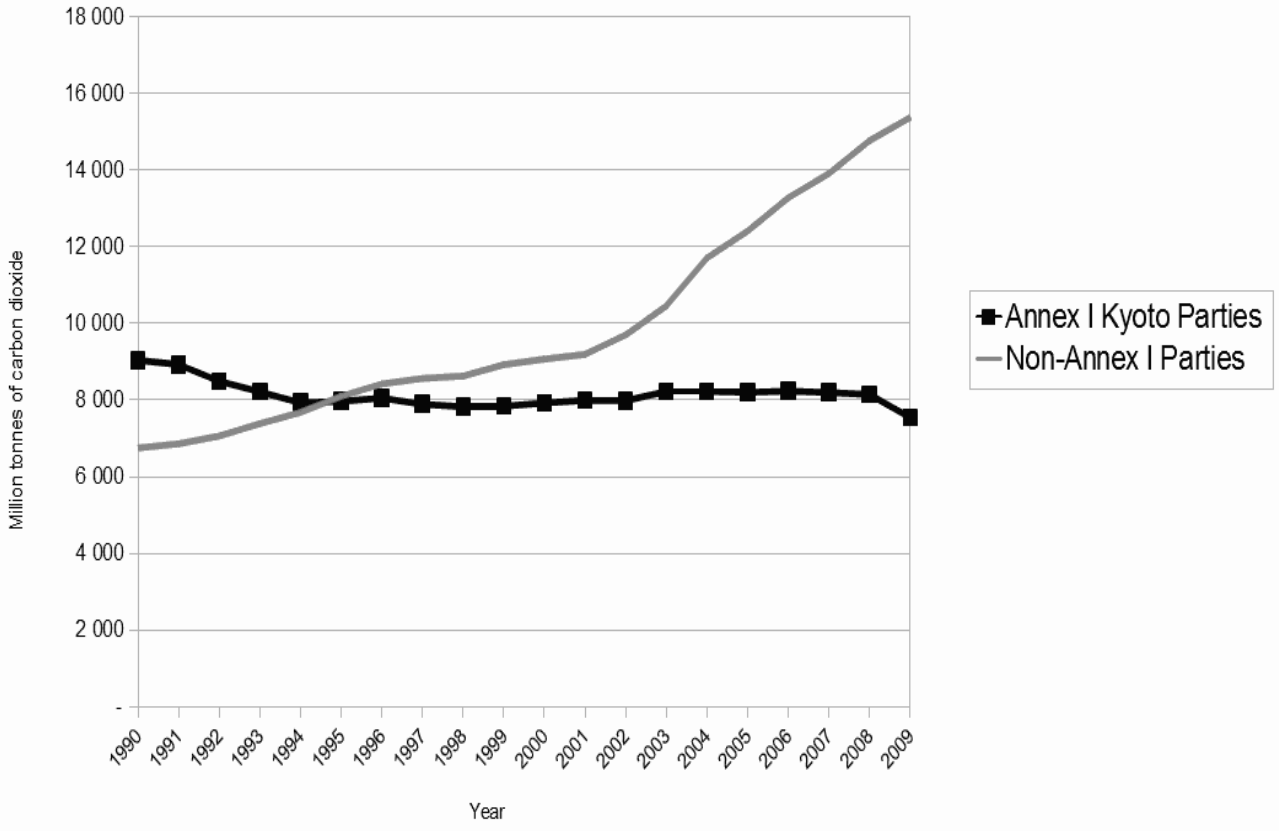
Kyoto Protocol

Quantified Emissions Limitations or Reduction Commitments (2008 – 2012) & (2013 – 2020) / Annex B of the Protocol

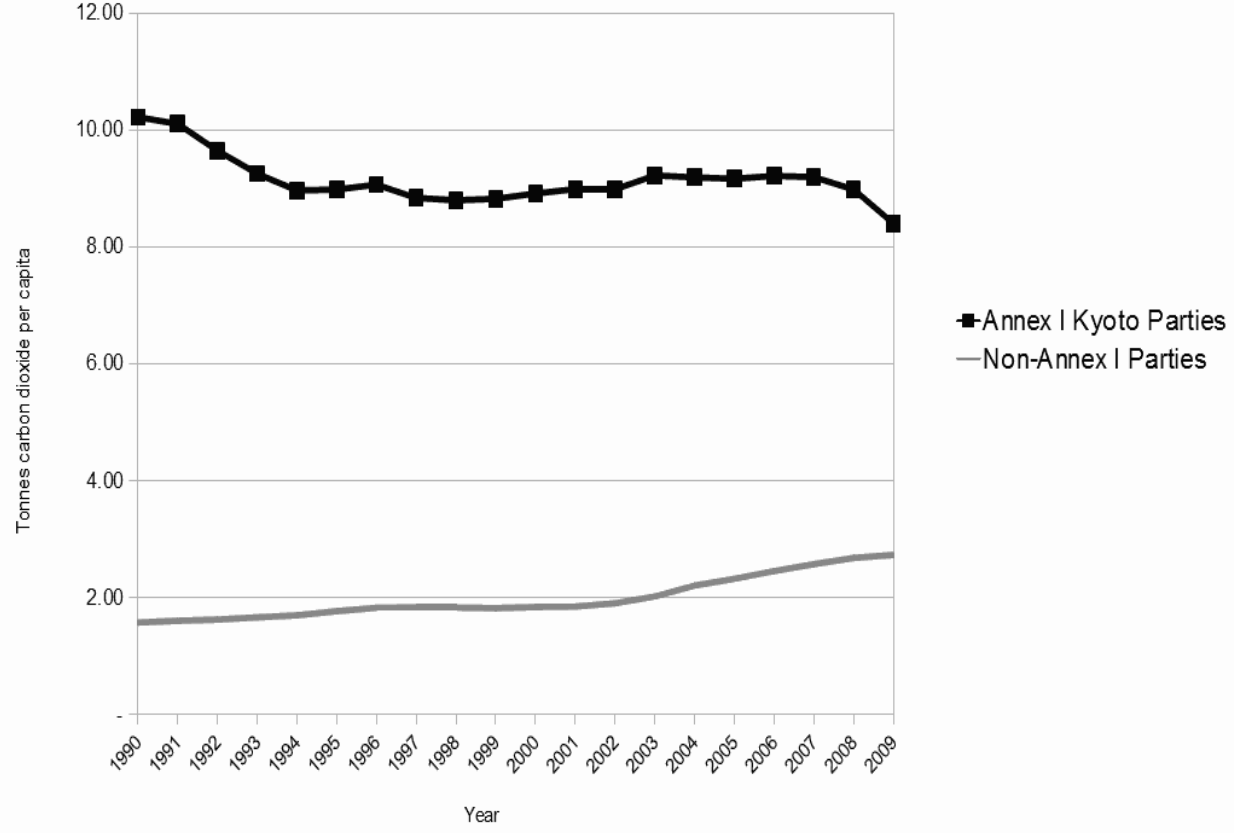
Party	Quantified emission limitation or reduction commitment (2008–2012) (percentage of base year or period)	Quantified emission limitation or reduction commitment (2013–2020) (percentage of base year or period)	Reference year	Quantified emission limitation or reduction commitment (2013–2020) (expressed as percentage of reference year)	Pledges for the reduction of greenhouse gas emissions by 2020 (percentage of reference year)
Australia	108	99.5	2000	98	–5 to –15% or –25%
Austria, Belgium, Bulgaria*, Croatia*, Czech Republic, Denmark, Estonia*, Finland, France, Germany, Greece, Ireland, Italy, Latvia*, Lithuania*, Luxembourg, Netherlands, Portugal, Romania*, Slovakia*, Slovenia*, Spain, Sweden, United Kingdom & Northern Ireland- (24)	92	80	NA		
Belarus5*		88			–8%
European Union	92	80		NA	–20%/–30%
Kazakhstan*		95		95	–7%
Liechtenstein	92	84		84	–20%/–30%
Monaco	92	78		78	–30%
Norway	101	84		84	–30% to –40%
Switzerland	92	84.2			–20% to –30%
Ukraine*	100	76	1990		–20%
Cyprus					
Hungary*	94				
Iceland	110				
Malta					
Poland*	94	80	NA	NA	

Kyoto Protocol

Annual CO_2 emissions (million tons)



Annual CO_2 emissions (per capita)



Kyoto Protocol

Kyoto Mechanism/ Implementation

Adaptation Fund

- Adaptation Fund (AF) established in 2001 to finance concrete adaptation projects and programmes in developing country Parties to the Kyoto Protocol that are particularly vulnerable to the adverse effects of climate change.
- The Fund is financed with the share of proceeds from clean development mechanism (CDM) project activities and other sources.

Management

- Established the Adaptation Fund Board (AFB) in 1/CMP.3, December 2007,under authority of the CMP.
- GEF provide Secretariat Service, and WB serves as Trustee of the AF.

Trading units in the carbon market

- The other units which may be transferred under the scheme, each equal to one ton of CO_2, may be in the form of:
  - A removal unit (RMU) on the basis of land use, land-use change and forestry (LULUCF) activities such as reforestation
  - An emission reduction unit (ERU) generated by a joint implementation project
  - A certified emission reduction (CER) generated from a clean development mechanism project activity
- Transfers and acquisitions of these units are tracked and recorded through the registry systems under the Kyoto Protocol.
- An international transaction log ensures secure transfer of emission reduction units between countries.

Clean Development Mechanism

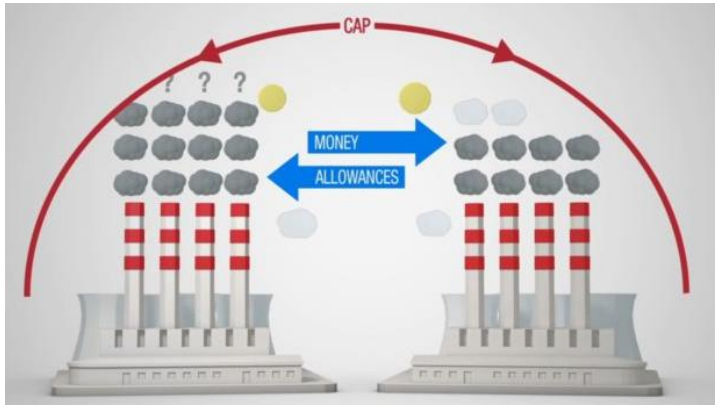
- Clean development mechanism (CDM) project activities and other sources of funding.
- The share of proceeds amounts to ***2 percent of certified emission reductions (CERs)*** issued for a CDM project activity.
- Clean Development Mechanism (CDM), defined in Article 12 of the Protocol, allows a country with an emission-reduction or emission-limitation commitment under the Kyoto Protocol (Annex B Party) to implement an emission-reduction project in developing countries.
- Such projects can earn saleable certified emission reduction (CER) credits, each equivalent to one ton of CO_2, which can be counted towards meeting Kyoto targets.

Kyoto Protocol

Adaptation Fund

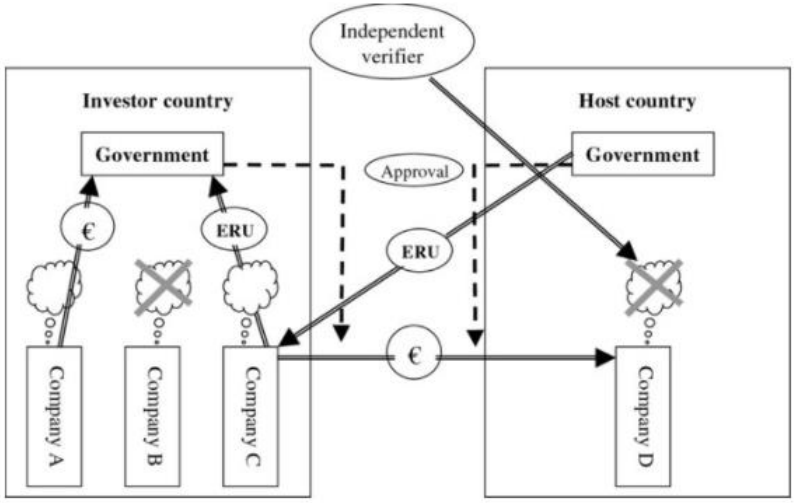
International Emissions Trading

- Parties with commitments under the Kyoto Protocol (Annex B Parties) have accepted targets for limiting or reducing emissions. These targets are expressed as levels of allowed emissions, or “assigned amounts”, over the 2008-2012 commitment period. The allowed emissions are divided into “assigned amount units” (AAUs).
- Emissions trading, as set out in Article 17 of the Kyoto Protocol, allows countries that have emission units to spare - emissions permitted them but not "used" - to sell this excess capacity to countries that are over their targets.
- Thus, a new commodity was created in the form of emission reductions or removals. Since carbon dioxide is the principal greenhouse gas, people speak simply of trading in carbon. Carbon is now tracked and traded like any other commodity. This is known as the "carbon market."



Joint Implementation

- Under Joint Implementation, countries with commitments under the Kyoto Protocol are eligible to transfer and/or acquire emission reduction units (ERUs) and use them to meet part of their emission reduction target.
- The mechanism known as "joint implementation", defined in Article 6 of the Kyoto Protocol, allows a country with an emission reduction or limitation commitment under the Kyoto Protocol (Annex B Party) to earn emission reduction units (ERUs) from an emission-reduction or emission removal project in another Annex B Party, each equivalent to one ton of CO_2, which can be counted towards meeting its Kyoto target.
- Joint implementation offers Parties a flexible and cost-efficient means of fulfilling a part of their Kyoto commitments, while the host Party benefits from foreign investment and technology transfer.



Kyoto Protocol

Adaptation Fund Board

Composition of the AFB

- The Adaptation Fund Board is composed of 16 members and 16 alternates representing Parties to the Kyoto Protocol, taking into account fair and balanced representation among groups as follows:
  - Two representatives from each of the five United Nations regional groups
  - One representative of the small island developing States (SIDS)
  - One representative of the least developed country (LDCs) Parties
  - Two other representatives from the Parties included in Annex I to the Convention (Annex I Parties)
  - Two other representatives from the Parties not included in Annex I to the Convention (non-Annex I Parties).

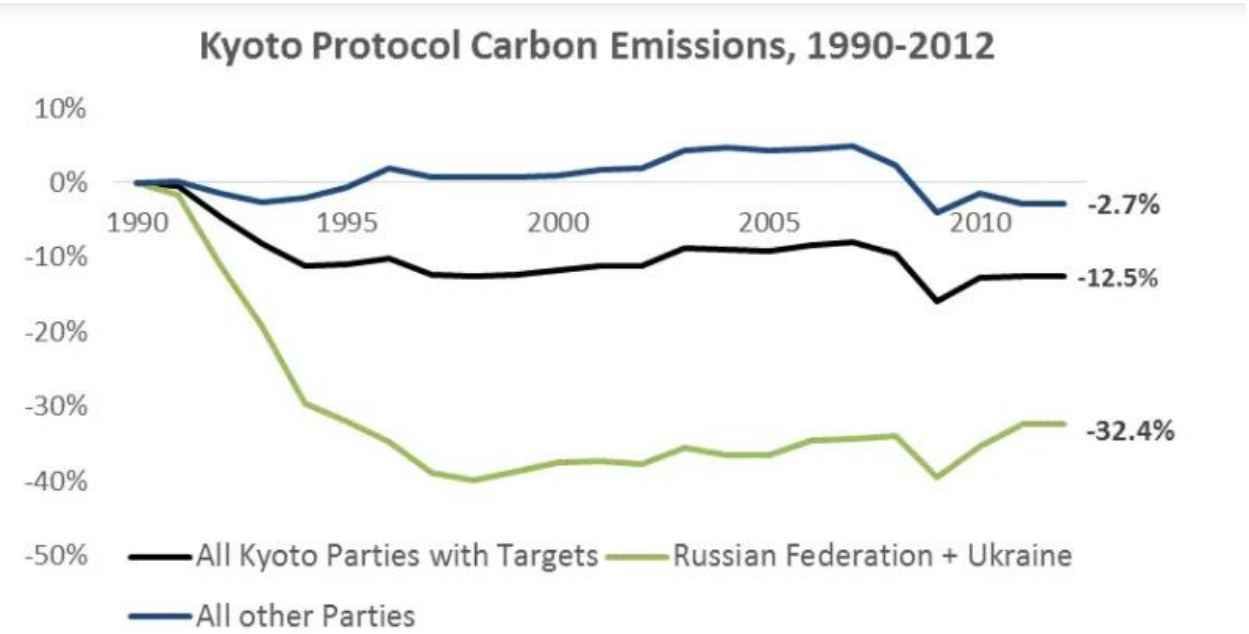
Land Use, Land-Use Change and Forestry (LULUCF)

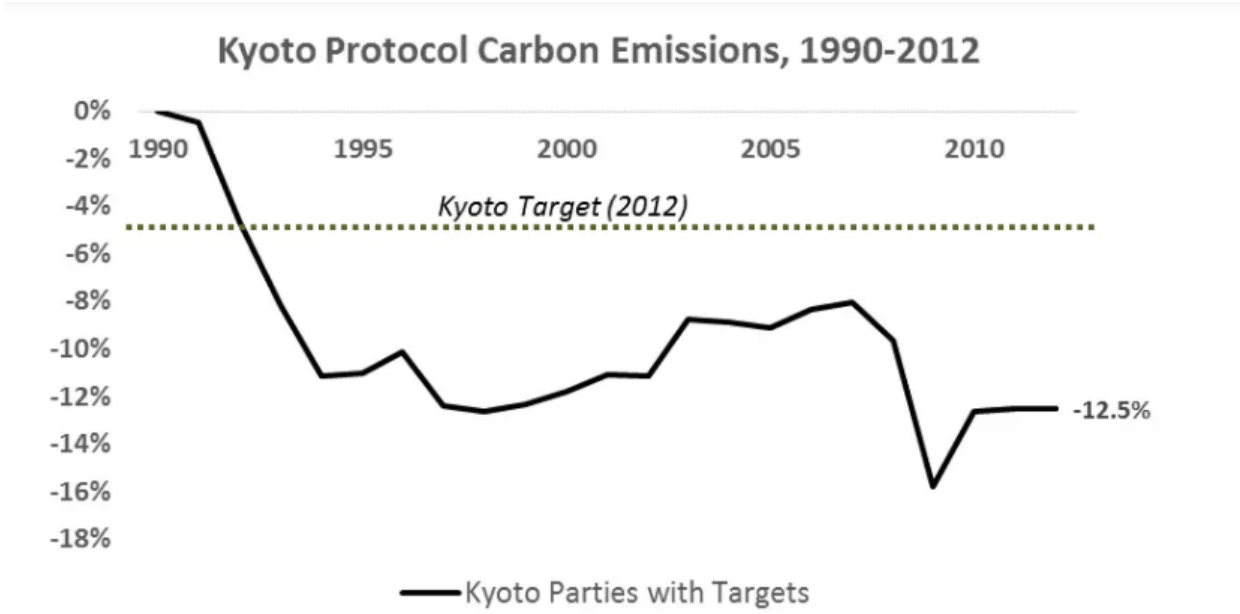
- The rate of build-up of CO_2 in the atmosphere can be reduced by taking advantage of the fact that atmospheric CO_2 can accumulate as carbon in vegetation and soils in terrestrial ecosystems. Under the United Nations Framework Convention on Climate Change any process, activity or mechanism which removes a greenhouse gas from the atmosphere is referred to as a "sink". Human activities impact terrestrial sinks, through land use, land-use change and forestry (LULUCF) activities, consequently, the exchange of CO_2 (carbon cycle) between the terrestrial biosphere system and the atmosphere is altered.
- Other terrestrial systems also play an important role. Most of the carbon stocks of croplands and grasslands are found in the below-ground plant organic matter and soil. Consequently, soil carbon sequestration in croplands and grasslands has a mitigation potential of 0.4–8.6 $CO_{2\text{-eq}}$/year according to the IPCC.
- However, the main drawback of LULUCF activities is their potential reversibility and non-permanence of carbon stocks as a result of human activities, natural disturbances or a combination of the two with loss of carbon stocks and release of GHG into the atmosphere as a result.
- Climate change is also predicted to have an effect on growth and decay rates including the occurrence of natural disturbances with regional differences around the world.
- Rapid reductions in anthropogenic greenhouse gas emissions that restrict warming to “well-below” 2°C would greatly reduce the negative impacts of climate change on land ecosystems according to the IPCC.

Kyoto Protocol

Climate Change Success or Global Warming Failure

- Many argue that Kyoto's failure is due to deficiencies in the structure of the agreement, such as
  - The exemption of developing countries from reductions requirements, or
  - The lack of an effective emissions trading scheme. Because of this, most Annex I countries have chosen to not comply with Kyoto commitments.
- Kyoto Protocol target of 4.7% CO_2 reduction by 2012.
- One of the key reasons might be the collapse of the Soviet Union. There was a rapid decline in heavy manufacturing industries across Russia and the newly independent states. This collapse was particularly significant in Russia and Ukraine, the two largest energy consumers in this group. It resulted in rapid decline in energy consumption of the Kyoto Protocol parties.
- since 1990 the world's CO_2 emissions have increased by a shocking 51%. Furthermore, a worrying 42% of the world's CO_2 emissions arise from just the USA and China – two countries that didn't sign up to the Kyoto Protocol.
- Any state reducing pollution emissions is paying 100% of the costs of those emission reductions in the short term, while only receiving a fraction of the benefits as the positive externalities cross borders and are only realized in the longer term.





The Intergovernmental Panel on Climate Change (IPCC)

Monitoring Emission Targets

Goal

- The Intergovernmental Panel on Climate Change (IPCC) is the United Nations body for assessing the science related to climate change.
- To provide policymakers with regular scientific assessments on climate change, its implications and potential future risks, as well as to put forward adaptation and mitigation options.

Creation

- 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP),

Members

- 195

Working Groups

- I - Deals with The Physical Science Basis of Climate Change,
- II – Deals with Climate Change Impacts, Adaptation and Vulnerability
- III – Deals with Mitigation of Climate Change.

Task Force

- The main objective of the Task Force on National Greenhouse Gas Inventories is to develop and refine a methodology for the calculation and reporting of national greenhouse gas emissions and removals.

The Intergovernmental Panel on Climate Change (IPCC)

IPCC Progress

2022	To approve Climate Change 2022: Impacts Adaptation and Vulnerability and Climate Change 2022: Mitigation of Climate Change, the Working Group II and Working Group III contributions to the Sixth Assessment Report. The IPCC to approve the Synthesis Report to the Sixth Assessment Report. (TBC).
2021	Climate Change 2021 approved: The Physical Science Basis, the Working Group 1 contribution to the Sixth Assessment Report (TBC).
2020	The outline of the Synthesis Report to the Sixth Assessment Report approved to be finalized in 2022.
2019	2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories approved. IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems approved. The Special Report on the Ocean and Cryosphere in a Changing Climate approved.
2018	An IPCC special report on the impacts of global warming of 1.5 degrees Celsius above pre-industrial levels and related global greenhouse gas emission pathways approved in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty.
2017	The outlines of the Working Group contributions to the Sixth Assessment Report approved.
2014	Climate Change 2014: Impacts Adaptation and Vulnerability and Climate Change 2014: Mitigation of Climate Change, the Working Group II and Working Group III contributions to AR5 approved. The Fifth Assessment Report was completed in 2014 with the Synthesis Report.
2013	Climate Change 2013 approved: The Physical Science Basis, the Working Group I contribution to AR5 - The IPCC approves two Methodology Reports: the 2013 Supplement to 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands (Wetlands Supplement) and the 2013 Revised Supplementary Methods and Good Practice Guidelines Arising from the Kyoto Protocol (KP Supplement).
2010	A review of its processes and procedures started, completed in 2012, based on recommendations from the InterAcademy Council.

The Intergovernmental Panel on Climate Change (IPCC)

IPCC Progress

2007	Fourth Assessment Report (AR4) published. (Working Group I – Climate Change 2007: The Physical Science Basis; Working Group II – Climate Change 2007: Impacts, Adaptation and Vulnerability; Working Group III – Climate Change 2007: Mitigation of Climate Change; Climate Change 2007: Synthesis Report). 2007- The IPCC shares the Nobel Peace Prize which is awarded for its "efforts to build up and disseminate greater knowledge of man-made climate change, and to lay the foundations for the measures that are needed to counteract such change".
2006	Guidelines for National Greenhouse Gas Inventories issued.
2003	The Good Practice Guidance for Land Use, Land-Use Change and Forestry issued.
2001	Third Assessment Report (Working Group I – Climate Change published. The Scientific Basis; Working Group II – Climate Change 2001: Impacts, Adaptation, and Vulnerability; Working Group III – Climate Change 2001: Mitigation; Climate Change 2001: Synthesis Report).
2000	The Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories issued.
1998	Task Force on National Greenhouse Gas Inventories (TFI) set up to oversee the National Greenhouse Gas Inventories Programme. Since 1999 the Task Force has been supported by the Government of Japan.
1997	The UNFCCC's Kyoto Protocol is adopted. It comes into force in 2005.
1996	The Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories issued.
1995	The Second Assessment Report published (Working Group I – Climate Change, The Science of Climate Change; Working Group II – Climate Change 1995: Impacts, Adaptations and Mitigation of Climate Change: Scientific-Technical Analyses; Working Group III – Climate Change 1995: Economic and Social Dimensions of Climate Change
1992	Supplementary Reports published (Working Group I – Climate Change 1992: The Supplementary Report to the IPCC Scientific Assessment; Working Group II – Climate Change 1992: The Supplementary Report to the IPCC Impacts Assessment; Climate Change: The IPCC 1990 and 1992 Assessments). - The United Nations Framework Convention on Climate Change (UNFCCC) opened for signature at the UN Conference on Environment and Development in Rio de Janeiro.
1990	First Assessment Report published (Working Group I – Climate Change: The IPCC Scientific Assessment; Working Group II – Climate Change: The IPCC Impacts Assessment; Working Group III – Climate Change: The IPCC Response Strategies). - The UN General Assembly noted the report findings and decided to initiate negotiations for a framework convention on climate change.
1988	The United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) established the Intergovernmental Panel on Climate Change (IPCC). The United Nations General Assembly endorsed the action of UNEP and the WMO in setting up the IPCC.

Paris Agreement

A legally binding international treaty on climate change

Adopted	• 12 December 2015 at COP 21 in Paris,
Entered into Force	• 4 November 2016
Parties	• 196 Countries

Goal	• To limit global warming to well below 2, preferably to 1.5 degrees Celsius, compared to pre-industrial levels. • To achieve this long-term temperature goal, countries aim to reach global peaking of greenhouse gas emissions as soon as possible to achieve a climate neutral world by mid-century. • The Paris Agreement is a landmark in the multilateral climate change process because, for the first time, a binding agreement brings all nations into a common cause to undertake ambitious efforts to combat climate change and adapt to its effects.

Mechanism	• Implementation of the Paris Agreement requires economic and social transformation, based on the best available science. The Paris Agreement works on a 5- year cycle of increasingly ambitious climate action carried out by countries. By 2020, countries submit their plans for climate action known as nationally determined contributions (NDCs). • In their NDCs, countries communicate actions they will take to reduce their Greenhouse Gas emissions in order to reach the goals of the Paris Agreement. Countries also communicate in the NDCs actions they will take to build resilience to adapt to the impacts of rising temperatures.

Paris Agreement

A legally binding international treaty on climate change

Coordination

- The Paris Agreement provides a framework for financial, technical and capacity building support to those countries who need it.
  - Finance
  - Technology
  - Capacity Building

Finance

- The Paris Agreement reaffirms that developed countries should take the lead in providing financial assistance to countries that are less endowed and more vulnerable, while for the first time also encouraging voluntary contributions by other Parties.
- Climate finance is needed for mitigation, because large-scale investments are required to significantly reduce emissions.
- Climate finance is equally important for adaptation, as significant financial resources are needed to adapt to the adverse effects and reduce the impacts of a changing climate.

Technology

- The Paris Agreement speaks of the vision of fully realizing technology development and transfer for both improving resilience to climate change and reducing GHG emissions.
- It establishes a technology framework to provide overarching guidance to the well-functioning Technology Mechanism.
- The mechanism is accelerating technology development and transfer through it's policy and implementation arms.

Capacity Building

- Not all developing countries have sufficient capacities to deal with many of the challenges brought by climate change.
- As a result, the Paris Agreement places great emphasis on climate-related capacity-building for developing countries and requests all developed countries to enhance support for capacity-building actions in developing countries.

Paris Agreement

What have we achieved so far?

Achievement

- Although climate change action needs to be massively increased to achieve the goals of the Paris Agreement, the years since its entry into force have already sparked low-carbon solutions and new markets.
- More and more countries, regions, cities and companies are establishing carbon neutrality targets.
- Zero-carbon solutions are becoming competitive across economic sectors representing 25% of emissions.
- This trend is most noticeable in the power and transport sectors and has created many new business opportunities for early movers.
- By 2030, zero-carbon solutions could be competitive in sectors representing over 70% of global emissions.

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